RADIO CORPORATION OF NEW ZEALAND LIMITED

Cables: "MARKSLIM"
Telegrams: "RADICENTRE"

RADIO MANUFACTURERS

80 COURTENAY PLACE, WELLINGTON, C3, N.Z.

Telephone 55-020
G.P.O. Box 696

January, 1958.
No. 8

TO: RADIO CENTRES & DEAIERS.

Coupled with the release of the Columbus "Transistor Seven" (Model 897P) a new and interesting phase of electronic servicing is opened up.

The attached "Advance Technical Data" has been issued to enable you to become familiar with the servicing techniques peculiar to the "Transistor Seven" in particular and transistorised radio in general.

The technical data sheet and circuit diagram will be issued shortly.

L. W. Hurrell
WORKS MANAGER

LWH'JH
Encl.

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ADVANCE TECHNICAL DATA

Columbus Transistor Portable 897P.

GENERAL.

This seven transistor receiver has been specially designed for New Zealand conditions. It is a full sized portable using full sized components.

It is housed in a cabinet of modern design, with a washable plastic exterior.

The words Transistor Seven are boldly embossed across the escutcheon top panel.

There are two controls only:

1. Tuning control

2. Volume control conveniently located at right hand end of the receiver incorporates the ON/OFF switch.

Our aim with the release of this, our first transistor receiver, was to provide a product readily demonstrated as superior to an equivalent valve type and this has been achieved - particularly in respect to the obvious feature of Power Output and Tone.

The available electrical power output from this receiver is at least twice that obtained with the 3V4 valve used almost exclusively in normal receivers.

In addition a full 7" x 5" high sensitivity speaker gives really big set performance.

The battery equipment chosen for this receiver is the Eveready type 276P.

This 9 volt battery is of the new American layer built construction designed especially for transistor operation and has the following advantages:

1. Minimum weight and physical size for a given life.

2. Simple plug and socket connection giving excellent permanent contact.

continued....

3. Will not leak electrolyte as other batteries, particularly torch cells whch are designed for intermittent high current use.

4. Incorrect connection of battery polarity with consequent damage is impossible.

5. The battery measures 3.1/2" x 2.1/2" and 2" and weighs 14 ounces.

The receiver complete with battery weighs 7 lbs.

With normal use we would expect a battery life in excess of 300 hours.

CHASSIS CONSTRUCTION

A unique feature is the application of a vertical chassis virtually built around the large 7 x 5 speaker. Viewed from the rear of the cabinet we see only a neat array of normal top side components yet with the chassis removed all wriring is accessible since there are no flanges on this side of the chassis.

The handle mounting screws fit direct to the chassis flange thus transferring the weight of the chassis, speaker and battery directly to the carrying handle.

Removal of three screws allows the complete chassis to be drawn from the cabinet.

CIRCUIT.

Seven transistors and one germanium diode are used in the following circuit line up:

RCA Type	2N219	- Mixer Oscillator
RCA Type	2N219	- 1st I.F. amplifier
RCA Type	2N219	- 2nd I.F. amplifier
Telefunken Type	OC602	- 1st Audio amplifier
" "	OC602	- Audio driver
" "	OC604 spec.	} Class B audio output.
" "	OC604 spec.	}
	OA150	- Diode detector and A.V.C.

Transistor Voltage and currents.
(Note) Negative with respect to chassis.

Transistor	Collector	Base	Emitter	Emitter Current
2N219 Converter	7.1v	0.83v	.82c	1.5 mA
2N219 1st I.F.	7.9v	0.57v	0.47v	0.2 to 0.7 mA
2N219 2nd I.F.	7.5v	0.57v	0.47v	0.9 mA
OC602 1st Audio	6.6v	1.23v	1.17v	1.2 mA
OC602 2nd Audio	6.5v	0.87v	0.8v	1.7 mA
OC604 Spec. Output	9.0v	0.15v	-	2.0 mA

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a. Total no signal current drain = 15 mA

b. The above voltages were measured with a 20,000 ohm/volt meter, and the use of any meter of lower impedance will give doubtful results.

Circuit Details.

Superheterodyne, self-excited mixer, two I.F. stages both neutralised, two audio amplifiers both transformer coupled and Class B output stage, collector to collector impedance 250 ohms. Loud speaker voice coil impedance, 15 ohms.

Three double tuned impedance matching I.F. transformers are used giving an I.F. selectivity superior to most valve type portables. It is of interest that most overseas transistor receivers only use three single tuned transformers with resulting inferior selectivity.

Audio coupling transformers are used in all audio stages. This allows correct matching of the transistors, achieves maximum audio gain and allows the use of a high degree of inverse feedback with consequent reduction in distortion. This is particularly important if satisfactory operation is to be achieved with batteries nearing the end of their life.

All transistors are automatically compensated for variation of temperature and in addition the output stage is protected by a special negative temperature co-efficient resistance.

The class B output stage ensures the most economical battery operation since the lower the volume control setting the lower is the current drain from the battery.

Automatic volume control is featured to ensure satisfactory operation on varying signal strengths.

Superior manual volume control is achieved by the use of a ganged potentiometer giving control over two stages.

The use of a high Q ferrite rod aerial ensures adequate signal pick up.

IMPORTANT POINTS TO NOTE.

1. Transistors are extremely sensitive to heat and temperature in excess of 90°C can cause permanent damage. For this reason, soldering of transistor leads is to be done as rapidly as possible with the soldering iron kept as far away from the transistor body as is practicable.

2. The polarity of coupling electrolytic capacitors must be correct. Whilst reversed electrolytics will not damage the transistors the performance of the receiver will be affected either in sensitivity or in severe audio distortion. Close examination must be made of electrolytics connected accidently into the circuit with the polarity reversed and remember the old adage "if in doubt throw it out".

continued ...

3. The use of screwdrivers as a means of checking high tension, as is sometimes done in mains operated receivers, is not only a waste of time but can permanently damage the transistors. Similarly the indiscriminate shorting out of bias resistors as a means of checking whether certain stages are operating will almost certainly have drastic results.

4. Continuity testing the receiver whilst the transistors are in circuit will not only give misleading results due to the transistors acting as low impedance diodes, but also the voltage source in the ohmeter can cause damage to the transistors.

5. Voltmeters used for test purposes must be at least 10,000 ohms per volt. The use of low impedance meters will give misleading results as serious shunting effects will occur.

6. The transistor leads are coded by the manufacturer, the spot being next to the collector, the centre lead is always the base and the remaining lead the emitter.

7. For a simple analogy between a normal valve receiver and the transistorised receiver, regard the transistors as triodes with the collector as the anode, the base as the control grid and the emitter as the cathode.

ALIGNMENT.

897 Tuning Range - 525 Kc/s to 1650 Kc/s.

897 Intermediate Frequency - 455 Kc/s

1. I.F. Alignment. With the gang fully closed, and using an isolating capacitor of approximately .1 UF clip the generator across the aerial section of the gang. The slugs in the third, second and first I.F. transformers are then adjusted in that order. These adjustments are then repeated until maximum output is obtained.

2. R.F. Alignment. The R.F. alignment follows standard procedure e.g. the top frequency being 1650 Kc/s. When attempting R.F. alignment always note the factory setting of the aerial and oscillator trimmers and the oscillator coil slug. Owing to the autodyne circuit arrangement some pulling may occur if these presets are far from factory setting.

3. The receiver must be checked on 6 volts for low voltage operation. Whilst sensitivity and available power output will decrease, the receiver must operate satisfactorily without obvious audio distortion at normal listening levels.

4. Output meter connection.
The correct operating conditions are obtained if an output meter of 250 ohms impedance is connected from collector to collector of the OC 604 Spec. output stages with the voice coil open circuit. If the voice coil is left connected the load is reduced such that the dissipation of the OC 604 Spec. may be exceeded at high output levels.

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In the general case where only an indication of output is required for alignment purposes an output meter of not less than 2,000 ohms may be connected as above, with the voice coil left in circuit.

Remember also that both sides of the output meter are above chassis.

FAULT FINDING.

1. If the audio amplifier is inoperative and all voltages are correct a continuity check of transformer secondary windings and coupling electrolytics should show the fault. If the voltages vary more than 20% from those issued in the specification a visual check of components for shorts etc. or a continuity check with the transistor in question disconnected may reveal the fault. As a last resort, change the transistor. Severe audio distortion probably indicates that one of the OC604 Specials is inoperative, either due to a faulty circuit component or transistor.

NOTE: When signal tracing in the audio section connect the audio generator via an electrolytic capacitor of approximately 20UF observing the correct polarity. This is necessary to block the D.C. path and to observe the matching of the low impedance circuits.

2. If the audio stages are operating satisfactorily and the receiver is still dead, check the I.F. stages in turn by connecting the generator across the respective bases and chassis, using an isolating capacitor.

3. If the receiver is inoperative at R.F. and checks O.K through the I.F. channel the oscillator may be suspect. This can be checked by measuring the voltage between base and emitter of the converter. If the base is negative with respect to the emitter by more than 0.12 volts then the converter is not oscillating.

4. Replacement of Transistors.
In the event of a transistor requiring replacement, extreme care has been taken in the receiver design to ensure as far as possible that no changes of circuit apart from the normal realignment procedure will be necessary.